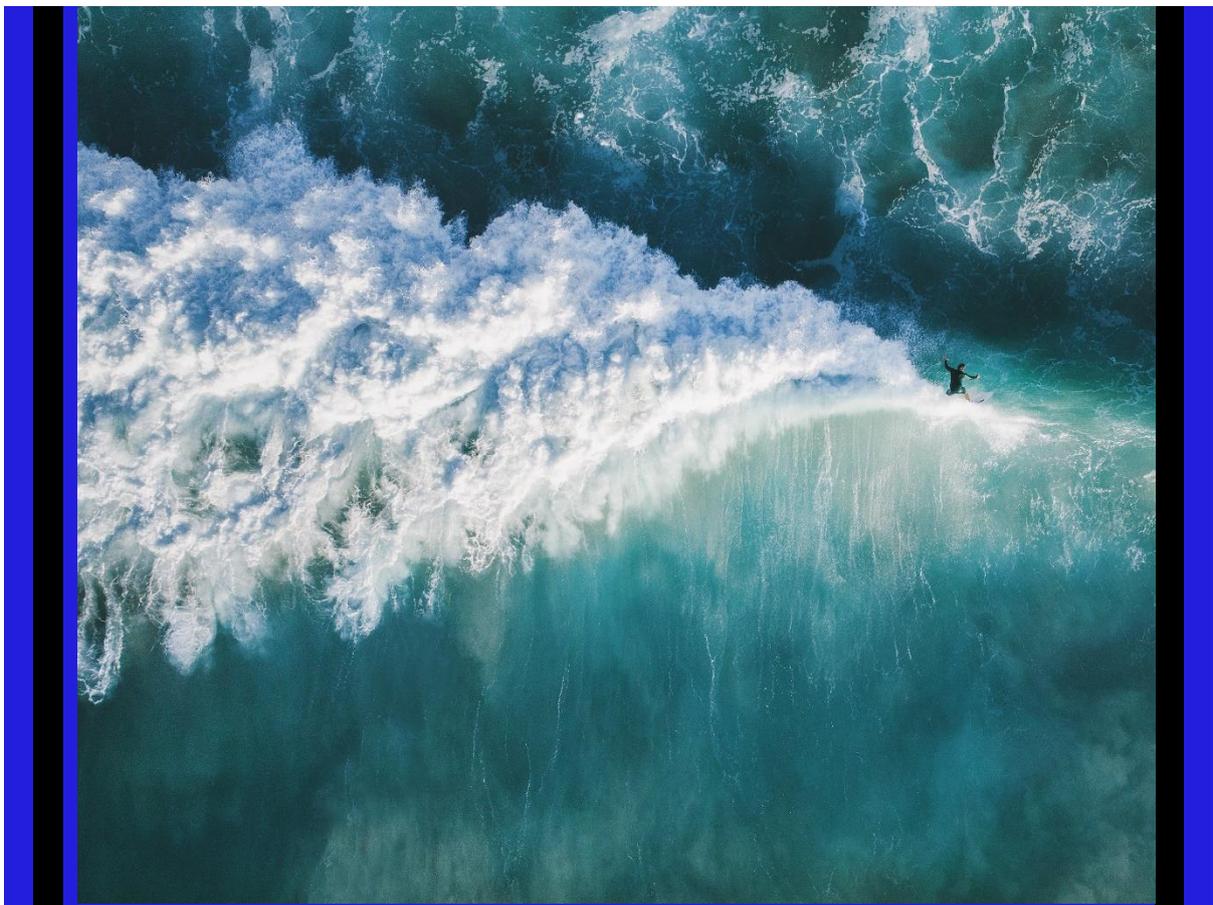


## Pembroke Power Station Abstraction Licence Renewal: SSSI Assessment

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RWE Generation UK plc

Pembroke Power Station  
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## 1. Introduction

### 1.1 Overview

Water is abstracted year round from Pennar Gut for non-evaporative cooling of RWE Generation UK plc's (RWE) Pembroke Power Station. Cooling water is drawn from Pennar Gut, at the mouth of the Pembroke River. The current licence (see below) is due to expire on the 31st March 2025.

The existing licence (22/61/06/0156) was originally granted by Environment Agency Wales (EAW) on the 3rd February 2009, and reissued by National Resource Wales (NRW) on the 21st November 2014 to reflect the change in name of the Competent Authority. The licence allows for the following maximum quantities of water to be abstracted from Pennar Gut, Pembroke Dock (NGR SM9365402652):

- 144,000 cubic metres per hour
- 3,456,000 cubic metres per day
- 1,200,000,000 cubic metres per year
- at an instantaneous rate not exceeding 40 cubic metres per second.

The proposed water abstraction licence renewal for Pembroke Power Station is intended as a 'like for like' renewal, with no changes to the current licenced volumes of abstracted sea water, nor changes to the conditions attached to the licence. For avoidance of doubt, the renewal will enable the continued operation of Pembroke Power Station in the same way as already authorised.

### 1.2 Purpose of this Report

This document was prepared at the request of NRW in support of the abstraction licence renewal. The report assesses whether the Pembroke power Station abstraction licence renewal affects habitats and species cited within the Milford Haven Waterway Site of Special Scientific Interest (SSSI)<sup>1</sup>.

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<sup>1</sup> Countryside Council for Wales. 2002. Site of Special Scientific Interest Citation: Milford Haven Waterway. [https://naturalresources.wales/media/639589/SSSI\\_0282\\_Citation\\_EN0010ded.pdf](https://naturalresources.wales/media/639589/SSSI_0282_Citation_EN0010ded.pdf) Accessed April 2024

## 2. Baseline Environment

### 2.1 Site Description

The Milford Haven Waterway SSSI covers approximately 2,192 hectares and extends from the mouth of the Haven at Dale Point and Thorn Island to the upper reaches of the Daugleddau at Haverfordwest in the west and Blackpool Mill in the east.

The following features are described in the SSSI citation:

"The Milford Haven Waterway consists of a main channel that has extensive rocky shores, with large sandy beaches in embayments near the entrance, and mudflats in sheltered areas further up the channel and in muddy creeks (pills) at intervals along the length of the inlet. The foreshore supports good examples of a variety of intertidal marine habitats including muddy gravels, sheltered mud, moderately exposed sand, and sheltered rock. These shore types support a diverse range of intertidal communities, with species-rich rock pools, eelgrass *Zostera spp.* beds, and overhang and under-boulder communities. Tidal water movements are particularly strong in places, allowing the development of tide swept lower shore communities that are particularly rich, with animal species such as the breadcrumb sponge *Halichondria panicea*, gooseberry seasquirt *Dendrodoa glossularia* and star seasquirt *Botryllus schlosseri*. Other communities include beds of native oyster *Ostrea edulis* and areas of mixed sediment supporting segmented worms of the family Syllidae.

The saltmarshes within the Haven occur predominantly in sheltered areas within the upper regions of the main channel, and in the muddy creeks (pills) and embayments found at intervals along the length of the inlet. A variety of saltmarsh communities exist within the site, the most extensive being characterised by the pioneering species common cord-grass *Spartina anglica* on the lower shore. Other dominant species include sea purslane *Atriplex portulacoides*, common saltmarsh grass *Puccinellia maritima* and red fescue *Festuca rubra*. These grade into upper saltmarsh or brackish communities with occasional sea rush *Juncus maritimus* and saltmarsh rush *Juncus gerardii*. In some areas, there is a transition zone from upper saltmarsh into areas of reed-bed dominated by *Phragmites australis*. Species found within the saltmarsh include the nationally scarce lax-flowered sea-lavender *Limonium humile* and the one-flowered glasswort *Salicornia pusilla*.

The various habitats within the Haven support a rich assemblage of flowering plants. The site supports some of the largest populations in Pembrokeshire of species that have seen a marked decline at the national level over recent years. These populations include dwarf eelgrass *Zostera noltei*, marsh pea *Lathyrus palustris*, spurge-laurel *Daphne laureola* and wayfaring tree *Viburnum lantana*. Other nationally rare or scarce flowering plants include rock sea-lavender *Limonium procerum spp. cambrense*, musk stork's-bill *Erodium moschatum*, marsh mallow *Althaea officinalis* and chamomile *Chamaemelum nobile*.

The saltmarsh and mudflats within the Haven support significant numbers of over-wintering wildfowl and waders. This number rises during particularly hard winters, when the mild Pembrokeshire climate results in the Haven population becoming augmented by wildfowl and waders coming in from other estuaries to the east that have become frozen. Species of special interest within the Haven include little grebe *Tachybaptus ruficollis*, shelduck *Tadorna tadorna*, wigeon *Anas penelope*, teal *Anas crecca*, dunlin *Calidris alpina* and curlew *Numenius arquata*. The Haven makes up the lower part of the Cleddau catchment, an area recognised as being one of the most important places in southern Britain for the otter.

Saltmarsh on the site supports a number of nationally scarce invertebrate species including comb footed spider *Enoplognatha mordex*, the ground and short winged mould beetles *Bembidion laterale* and *Brachygluta simplex*, the weevils *Polydrusus pulchellus* and *Notaris bimaculatus*, the hoverfly *Platycheirus immarginatus* and the crane fly *Limonia (Dicranomyia) complicata*."

Table 1 below lists the marine habitats and species cited within the Milford Haven Waterway SSSI.

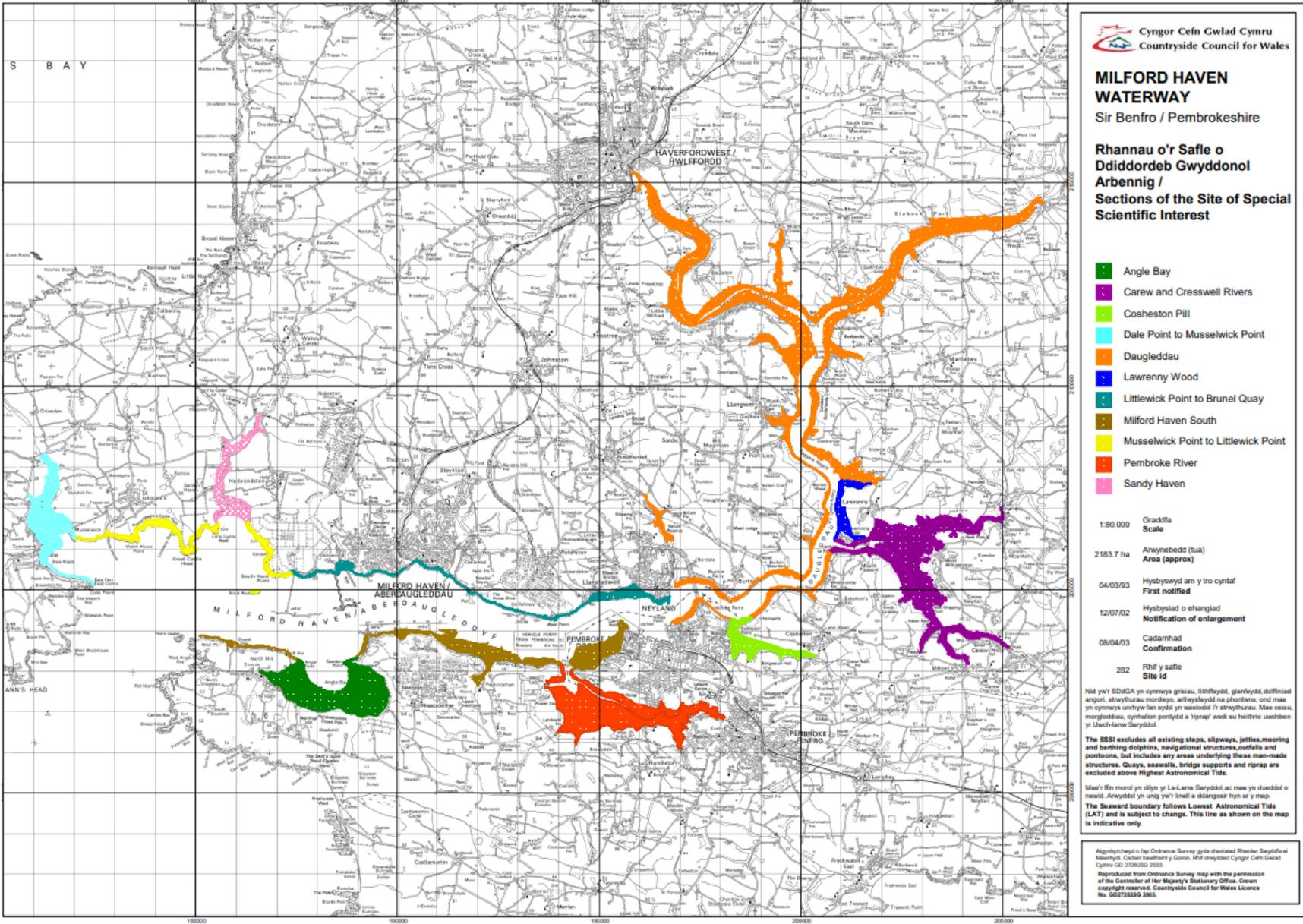
**Table 1: Marine features of the Milford Haven Waterway SSSI<sup>2</sup>**

Habitats	Species
Salt-marsh	<i>Anas crecca</i> Eurasian Teal
Eelgrass	<i>Anas penelope</i> Eurasian widgeon
Caves and overhangs	<i>Calidris alpina</i> Dunlin
Mixed substrata	<i>Numenius arquata</i> Eurasian curlew
Moderately exposed rock	<i>Tachybaptus ruficollis</i> Little grebe
Moderately exposed sand	<i>Tadorna tadorna</i> Common shelduck
Muddy gravel	<i>Osmerus eperlanus</i> European smelt
Rockpools	<i>Lutra lutra</i> Otter
Sheltered mud	<i>Alkmaria romijni</i> Tentacled lagoon worm
Sheltered rock	<i>Gammarus chevreuxi</i> An amphipod
Silled saline lagoon	
Tide-swept algae	
Under-boulders	

For management purposes the site has been divided into eleven sections. The names given to these are as follows: Angle Bay, Carew and Cresswell Rivers, Cosheston Pill, Dale Point to Musselwick Point, The Daugleddau, Littlewick Point to Brunel Quay, Milford Haven South, Pembroke River, Sandy Haven, Lawrenny Wood and Musselwick Point to Littlewick Point.

Of relevance to this assessment are the Pembroke River and Milford Haven south sections, which encompass the abstraction and discharge points for the Pembroke Power Station site.

<sup>2</sup> Welsh Government. 2012. Report to the National Assembly for Wales on Marine Protected Areas in Wales. Available online: <https://senedd.wales/media/pvndhhkt/gen-ld9150-e-english.pdf> [Accessed April 24]



## 2.2 Monitoring Programmes

The Milford Haven is one of the most studied areas of water with extensive monitoring undertaken by RWE as part of Power Station operations as well as routine water framework directive monitoring undertaken by Natural Resources Wales. Summaries of the monitoring undertaken, are provided in the following sections.

### 2.2.1 Milford Haven Waterway Environmental Surveillance Group (MHWESG)

The Milford Haven Waterway Environmental Surveillance Group is a collaborative group of statutory bodies, industry and others with an interest in the environmental quality of the Milford Haven Waterway. The Group's purposes include the provision of high-quality environmental information and to contribute to the maintenance, enhancement and safeguard of the Waterway's rich and diverse marine environment<sup>3</sup>. The Group maintains an annual programme of surveillance of the marine physical and chemical environment, marine biology and ornithology in the Milford Haven Waterway and Daugleddau Estuary, from a line between St Ann's Head and Sheep Island at the entrance to the Waterway to the upper tidal limits of the Eastern and Western Cleddau Rivers. To date MHWESG have over 25 years of environmental data including bioaccumulation of contaminants, water quality, sediment profiling, benthic and infaunal surveys and bird surveys.

### 2.2.2 Power Station Monitoring Programme (2006-2024)

A monitoring programme, to fulfil the requirements of preconstruction, construction and operational permitting of the Pembroke Power Station, has been undertaken since 2006. The scope of the monitoring programme is described in Table 2.

Table 2: Pembroke Power Station monitoring 2006 - 2024

Feature	Sampling programme	Data years
Intertidal fish	Sites in Pembroke River and the Haven sampled quarterly	2009 to present
Subtidal fish	Sites in Pembroke River and the Haven sampled quarterly	2009 to present
Entrapment	40 samples annually	2012 to present
Ichthyoplankton	Monthly samples from April to August inclusive at two sites	2007 to present
Plankton	Zooplankton (two seasons) and phytoplankton (monthly from march to October) from sites within the Haven	2006 to present
Water quality sampling	Monthly sampling the Haven and Pembroke River	2006 to present
Intertidal benthic	Core samples and rocky shore surveys from Pembroke River and Pwllcrochan flats annually	2008 to present
Subtidal benthic	Sites within Pembroke River and the Haven annually	2010 to present
Diver surveys	Three locations in the Haven sampled annually (full dive and maintenance dive)	2011 to present
Bioaccumulation	Surveys undertaken in the Haven and at two reference sites annually (February and September).	2012 to present
Eelgrass	Surveys in Pembroke River and the Haven	2009 to present

<sup>3</sup> Milford Haven Waterway Environmental Surveillance Group. 2024. Available online: <https://www.mhwesg.org.uk> [Accessed April 2024]

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Feature	Sampling programme	Data years
Macroalgae	Surveys in Pembroke River and the Haven	2013 to present

This monitoring programme has been informed by and agreed in consultation with the national environmental regulator. The detail of the programme has been continually reviewed and agreed with the regulator in response to observations made through the programme (e.g. reduction in frequency, reduction in number of sites). The most recent interpretative results of this monitoring programme are available:

- Intertidal Rocky Shore Communities 2021
- Abiotic Report 2021
- Macroalgae and Eelgrass 2021
- Intertidal Soft Sediment 2021
- Marine Ecology 2021
- Subtidal Reefs Monitoring Report 2021
- Subtidal Benthic Report 2021
- Fish Survey Report 2021
- Entrapment Pressure Report 2021

### 3. Proposed Project

#### 3.1 General Description

As explained in section 1.1 water is abstracted year round from Pennar Gut for non-evaporative cooling of RWE’s Pembroke Power Station under licence 22/61/06/0156. The licence allows for water to be abstracted from Pennar Gut, Pembroke Dock (NGR SM9365402652).

#### 3.2 Proposed Commitments

##### 3.2.1 Existing Mitigation

The current abstraction licence has been in place since 2009 and has specific mitigation measures in place for operations (Table 3). These measures have been active since commissioning of the station and therefore the level of confidence in the effectiveness of mitigation is high. The design of the intake complies with best practise requirements.

Table 3. Mitigation Measures for the Pembroke Power Station abstraction

Mitigation Measure	Evidence of Success
Operation	
Use of acoustic fish deterrents  Strobe lighting at the intake structure	Installed measures meet best practice  The successfulness of fish deterrents is species specific, depending on the design of the system and between hearing and non-hearing fish specialists. AFD deflection may be less than 30% in flatfish and other epibenthic species, and >90% in hearing specialists. Typical fish deflections from AFD is 50-80%. Specific trials on the efficacy of the system at Pembroke have been agreed to not be possible as trials required the station to operate for a year without the AFD in operation to generate statistically robust data. It was agreed with NRW that this was not appropriate as the AFD is required within the permit. Ongoing monitoring is undertaken to monitor the continued effect of installed measures and ensure that best practice is being met.
Coarse screens with 50mm bar spacing  Rotating drum screen(s) with 6mm mesh	Best practice <sup>4</sup>
Fish recovery/return  Backwashed fish return system	The fish recovery and return system is considered best practice design. It includes features such as: fish friendly buckets and screens, 6mm mesh sizes, dual pressure backwash system for fish and debris, enclosed fish lines, dedicated FRR lines, continuous wash water, fish holding tank that discharges at certain states of tide to avoid re-entrapment and ensures that fish are returned when the end pipe is submerged. The successfulness of FRR differs between species (0% for clupeids up to 80% for flatfish and salmonids – figures represent survival).  Monitoring of the fish return between 2014 and 2021 indicates that the FRR is effective at returning between 29-72% of total fish catch (and 24-78% of the total fish biomass) annually to Pennar Gut.  Since operation of the power station (under the existing abstraction licence) survivability of species through the fish return has been studied (through desk assessment and practical survivability studies at Pembroke). Survivability of the FRR has been tested and

<sup>4</sup> Turnpenny, A.W.H., and O’Keeffe, N.J. 2005. Best Practice Guide for Intake and Outfall Fish Screening. Environment Agency. R&D Contract No. W6-103, Final Report, Environment Agency, Bristol.

Mitigation Measure	Evidence of Success
	identifies 94% and 84% survivability of flatfish and gobies respectively, 80% survivability for dogfish, European eel, rays and conger eel. Gadoids, mullet stickleback, sea lamprey, breaks, pipefish and gurnards have a survivability of 50-66% <sup>5</sup> . Bass and sand smelt have a survivability of 30-38% and all other species have a survivability of 0% (including clupeids, sand eel, salmonids, wrasse and mackerel).

### 3.3 Pathways to Effect on SSSI Habitats/Species During Abstraction

As outlined in Section 2.1 the Milford Haven Waterway SSSI extends through the length of the estuary, from the mouth of the estuary to the tidal head on all major tributaries. Of particular relevance to this assessment are the Pembroke River and Milford Haven south sections, which encompass the abstraction and discharge points for the Pembroke Power Station site.

Habitats and species cited on the SSSI that are not features of the Pembroke River and South Milford Haven shoreline are considered sufficiently distanced from the effect of abstraction, and are therefore excluded from further consideration.

#### 3.3.1 Habitats

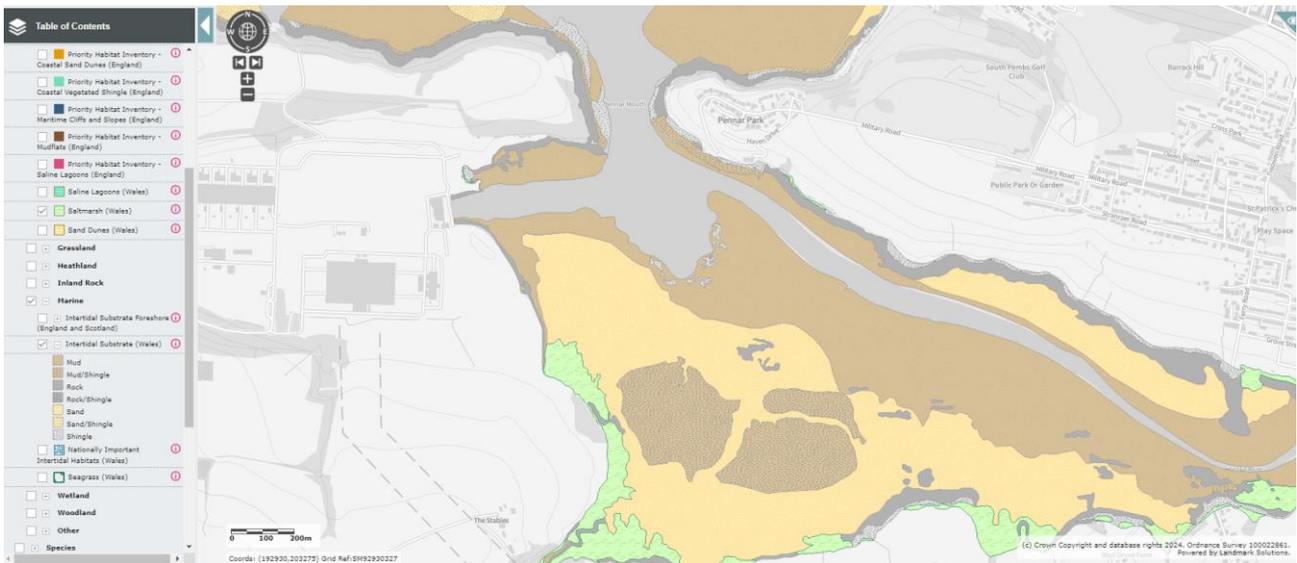
The abstraction of water in Pennar Gut draws water at all states of the tide, into the intake infrastructure of the power station. The intake was designed to ensure that the velocity induced by the abstraction was as low as reasonably practicable and remain below the best practise target velocity of 0.3ms<sup>-1</sup>.

These changes have the potential, e.g., through scour of sediments, to modify intertidal and subtidal habitats cited on the Milford Haven Waterway SSSI citation. The following habitats are located within the western extent of Pennar Gut (approx. 750m of the abstraction intake) and therefore could be considered within a precautionary zone of influence for hydromorphological effects from abstraction.

- Saltmarsh (98m to the north, 540m to the south)
- Eelgrass (234m east)
- Sheltered mud (23m south, 110m north)
- Muddy gravels (766m south east)
- Sheltered rock (20m north, 20m south)
- Tide-swept algae (519m north east – mouth of Pennar Gut, National important intertidal biotope)

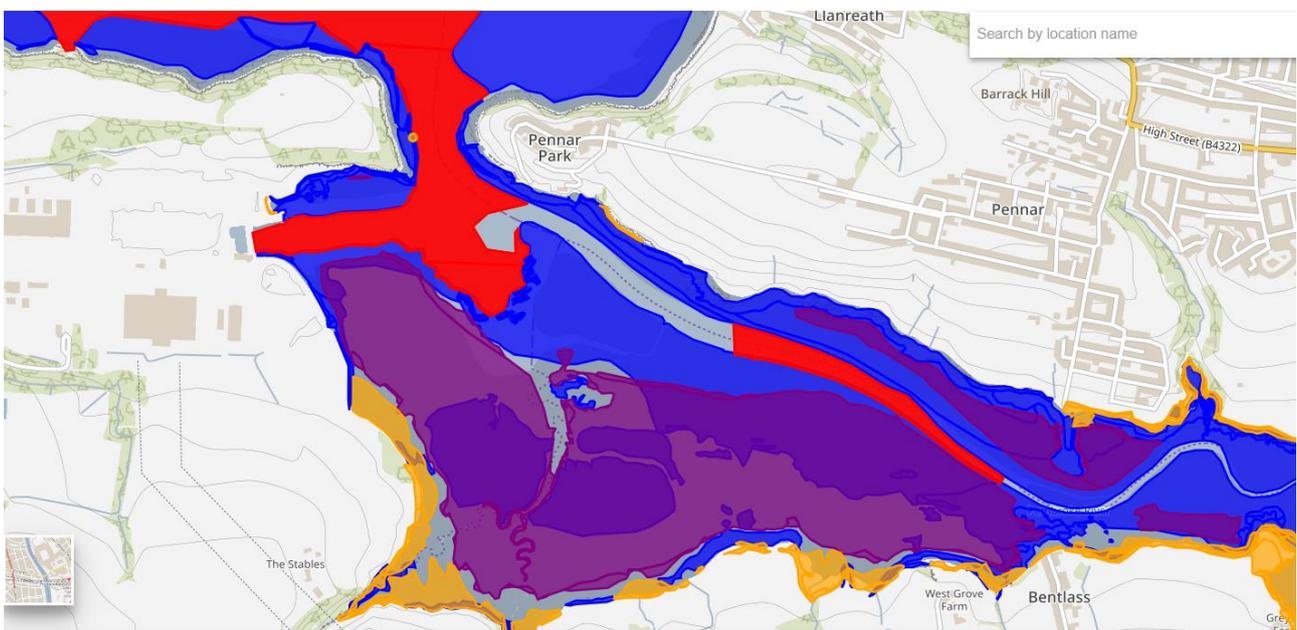
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<sup>5</sup> Jacobs (2023) Pembroke Environment Monitoring Quantification of Entrapment Pressure 2021. JUKL/B2386200/2021/R06



**Figure 1: Intertidal Substrate Map (Wales) and coastal habitats (saltmarsh). Taken from Magic (Defra, 2024)**

The intake structure and associated intake channel was designed to ensure that the induce velocity caused by abstraction was within Best Practise guidelines. At these low velocities sedimentation of the channel occurs which reduces the flow area below the design and hence maintenance dredging is necessary. The habitat type reported in this channel is sublittoral mixed muddy sediments - see red area of Figure 2<sup>6</sup> (DataMapWales, 2024). Maintenance dredging is undertaken as part of the wider dredging activities in the Milford Haven Waterway under marine licence. The last maintenance dredge was undertaken in 2023 and is programmed to be undertaken as required. As such, the sediment habitats within the Zol of the screen are considered to be highly disturbed.



**Figure 2: Environment (Wales) Act Section 7 and OSPAR: Marine Habitats**

<sup>6</sup> DataMapWales. 2024. Available online: <https://datamap.gov.wales/maps/new?layer=inspire-nrw:MarineBAOSPARHabitats#/> [Accessed April 2024]

Table 4 indicates that continued abstraction from the western corner of Pennar Gut has the potential to change the localised hydromorphology of the Pembroke River as it joins Milford Haven.

**Table 4: Potential pathway to effect on SSSI habitats from the Pembroke Power Station abstraction**

Source	Pathway	Receptor	Zone of Influence (Zoi)
Abstraction of water	Change to water velocity in the vicinity of the intake (<math>0.3\text{ms}^{-1}</math>)	Sediment granulometry and habitat types	500m (precautionary)

Whilst the volume of water abstracted is potentially large over a tidal cycle the intake frontage has been designed specifically to reduce the induced water velocity in front of the coarse screen face to comply with best practise requirements of  $0.3\text{ms}^{-1}$ . This ensures that any change in water velocity, that could subsequently drive hydromorphological change in sediment granulometry or distribution is localised to the intake channel.

### 3.3.2 Species

Of those species cited on the Milford Haven Waterway SSSI citation teal, widgeon, dunlin, curlew, little grebe, shelduck have records within the Pembroke River and Milford Haven southern shoreline sections of the SSSI, or are sufficiently mobile to utilise these areas.

There are no records of smelt from the Pembroke River or southern Milford Haven shore sections of the SSSI during the 2007-2024 monitoring programme and therefore it is considered that this species is absent from the southern sections of the SSSI. Otter are prolific in the Cleddau Rivers, and whilst they may frequent marine environments the Pembroke River and southern Milford Haven shores are not considered strongholds for this species. Whilst *Gammarus chevreuxi* may be found in estuarine environments, records from Milford Haven are associated with within the saline lagoon sites of the SSSI designation, which will not be affected by the Power Station abstraction. Finally the tentacled lagoon worm has previously been recorded in the main Haven (Hazelbeach opposite the mouth of Pennar Gut) but there are no records within the Pembroke River. These species have therefore been excluded from further assessment as not present within the zone of influence of the abstraction.

Table 5 indicates that the primary pathways for effect of abstraction from Pennar Gut is the direct loss of fish and invertebrate species that may either be cited or form a feeding resource for cited species, or the indirect effect of habitat loss.

**Table 5: Potential pathway to effect on SSSI species from the Pembroke Power Station abstraction**

Source	Pathway	Receptor	Zone of Influence (Zoi)
Abstraction of water	Loss of juvenile and adult fish and invertebrates through entrapment	Loss of prey resource for widgeon, dunlin, curlew, little grebe, shelduck	Pennar Gut
	Change to habitats from water velocity increase (<math>0.3\text{ms}^{-1}</math>) in the vicinity of the intake channel	Loss of habitat for widgeon, dunlin, curlew, little grebe, shelduck	Sheltered rock in western Pennar Gut Sheltered mud in western Pennar Gut

## 4. Assessment

### 4.1 Effects on Habitats

Of those SSSI habitats reported from Pennar Gut, it is considered that saltmarsh, eelgrass, muddy gravels and tide swept algae are sufficiently distant from the intake frontage to avoid any direct or indirect effect from changes in water velocity during abstraction.

#### 4.1.1 Sheltered Rock Habitats

Sheltered rock habitats lie closest to the intake frontage (within 20m) but have proven, over 12 years of power station operation, to be resilient to the effect of very localised variation in water velocities relating to operation of abstraction. The continued presence of the abstraction is not considered to present a risk to this SSSI habitat. The sheltered rocks present immediately north and south of the intake host a number of furoid species and continue to provide large substrate biotope in what is a predominantly depositional area of the lower Pembroke River.

#### 4.1.2 Sheltered Mud

Extensive sheltered mud, forming intertidal and subtidal mudflats are present out with the dredged channel to the intake frontage. Since inception of the Power Station monitoring programme, (2007 - 2024) no change in the extent of these mudflats has been observed. The velocity induced by the abstraction ( $<0.3\text{ms}^{-1}$ ) through the intake is anticipated to be relatively low compared to the maximum tidal velocity in this area and does not result in scour (demonstrated by the need for maintenance dredging). These habitats have been maintained, out with the existing dredged channel through the operation of the existing abstraction licence. As such the overall distribution and extent of the habitat feature within the site is considered to be stable. The abstraction of water at the intake will not adversely affect the physical biological and chemical structure of the mudflats. Low velocity abstraction, occurring over a very limited spatial range (essentially within the intake channel) will not result in degradation of function of this habitat type.

The continued presence of the abstraction is not considered to present a risk to this SSSI habitat, nor the potential for this habitat to support a feeding resource for waders listed on the SSSI citation.

### 4.2 Effects on Species

#### 4.2.1 Teal

Habitat: Teal are common throughout the winter and historically the main concentration was found on the Cleddau Estuary, upstream from Daucleddau. The species only breeds on Skomer and monthly totals of wintering teal for 2023-24 across all Pembrokeshire sites remain close to the ten year average for this species<sup>7</sup>. Winter habitats include brackish waters, sheltered inlets and lagoons along the shoreline. The mudflats at the western end of Pennar Gut are unlikely to form a preferential habitat type for teal. As described above, there is no reported loss of sheltered mud habitat, therefore consequentially no effect on teal habitat is predicted from continued abstraction.

Prey: In their overwintering habitats teal are predominantly herbivorous, feeding on seeds, aquatic plants and grasses, including sedges and grains. The Power Station abstraction entrains a range of marine flora, however much of this accumulates as loose material driven by prevailing wind towards the intake bay at the western end of Pennar Gut. There is no evidence that the operation of the abstraction is responsible for removing

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<sup>7</sup> Haycock, A. 2024. Available online: <https://pembsavifauna.co.uk/category/teal/> [Accessed April 2024]

vegetation from its rooted habitats elsewhere in the Pembroke River and thereby reducing the available feeding resource for teal.

#### **4.2.2 Wigeon**

**Habitat:** As a winter visitor wigeon are widespread across Pembrokeshire sites, however the majority are seen on the Pembroke River and Angle Bay<sup>8</sup>. Numbers across Pembrokeshire WeBS sites have been broadly consistent since 2003, with typical annual variation. Favouring coastal marshes and wetlands wigeon can also be found on wet grassland, floodplain meadows flooded gravel pits and reservoirs. Within the Pembroke River SSSI area wigeon are likely to favour vegetated intertidal areas to the east of Pennar Gut, and unlikely to heavily utilise the intertidal mud or rock habitats immediately adjacent to the intake structure. Wigeon numbers have remained within long term averages since commissioning of the Power Station, indicating no discernible effect from abstraction on wigeon populations.

**Prey:** Wigeon feed predominantly on aquatic plants, seeds and roots in shallow water. The Power Station abstraction entrains a range of marine flora and macroalgae, however much of this accumulates as loose material driven by prevailing wind towards the intake bay at the western end of Pennar Gut. There is no evidence that the operation of the abstraction is responsible for removing vegetation from its rooted habitats elsewhere in the Pembroke River and thereby reducing the available feeding resource for wigeon.

#### **4.2.3 Dunlin**

**Habitat:** Peak counts of dunlin are erratic within Milford Haven, with a general decline in number since the 1990s. As such, Milford Haven occasionally reaches the 5 year average threshold that would make this site nationally important for this species. The majority of recorded dunlin frequent the large open mudflats of Pembroke River, Carew-Cresswell and Hook-Sprinkle. Long term (decadal) averages indicate that most of the decline has occurred on the Pembroke River and the Carew-Cresswell sites<sup>9</sup>. Milford Haven population trends mirror those nationally, and correlate to a rise in dunlin numbers in the Netherlands, suggesting a preference for overwintering in the Wadden Sea, instead of the UK west coastline. Over wintering (WeBS) counts for dunlin 2023-2024 indicate average annual maximum counts remain within long term averages. numbers.

**Prey:** Dunlin prey on earthworms, marine worms, flies (midges, craneflies), beetles, snails, mussels, small clams, amphipods, small amounts of plant seeds and rarely small fish. Abstraction of water removes a small proportion of marine invertebrates from the mudflats adjacent to the intake. Given the semi industrial setting of the western Pennar Gut it is considered unlikely that the mudflats immediately adjacent to the operation power station will provide a significant feeding resource for dunlin, considering the availability of intertidal mudflats through the lower Pembroke River. Invertebrate loss attributed to the power station operation is considered to be negligible compared to the available resource within the wider estuary, with any losses in species density or biomass being highly localised to the intake.

There is no evidence that operation of the Pembroke abstraction since 2012 has resulted in a reduction in dunlin

#### **4.2.4 Curlew**

**Habitat:** Curlew numbers have declined nationally since the 1990s, and this is also true for Milford Haven. Breeding populations of curlew in Pembrokeshire are now only known from Skomer<sup>10</sup>. In winter curlew feed over tidal mudflats, saltmarsh and nearby farmland, before migrating to upland areas of rough pasture,

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<sup>8</sup> Haycock, A. 2024. Available online: <https://pembsavifauna.co.uk/category/wigeon/> [Accessed April 2024]

<sup>9</sup> Haycock, A. 2024. Available online: <https://pembsavifauna.co.uk/category/dunlin/> [Accessed April 2024]

<sup>10</sup> Haycock, A. 2019. A review of the status of wetland birds in the Milford Haven Waterway and Daugleddau Estuary, 2019. A report to the Milford Haven Waterway Environmental Surveillance Group.

moorland and wetland to breed. No loss of intertidal mudflat or saltmarsh as been observed since the operation of the Pembroke Power Station and therefore it is predict that continual operation of the abstraction will not affect intertidal habitats adjacent to the intake.

Prey: The abstraction at Pembroke will result in the loss of potential prey items to curlew (worms, shellfish and shrimp). However, the relatively low abundance of entrainment of these taxon groups, from a very small proportion of the estuary, which, as shown above is decreasingly utilised by curlew suggests a negligible effect on curlew populations. The presence of extensive mudflat and saltmarsh in the wider Pembroke River, Milford Haven and other less industrialised inlets and bays provide high quality curlew feeding grounds.

#### 4.2.5 Little Grebe

Habitat: The Cleddau estuary complex is considered to be the fifth most important site for little grebe in Wales, with the greatest concentration being on the Pickleridge lagoon on the Gann Estuary. Large sheltered estuarine embayments are an important habitat in cold winters when inland sites may freeze over. The distribution and the breeding population of little grebe in Pembrokeshire have increased dramatically in the past twenty years, but this has not been reflected in the wintering population on the estuary system. Little grebe have been consistently below the threshold for consideration for national importance on the Cleddau estuary since 2001/02<sup>11</sup>. Little grebe inhabit a wide range of inland and sheltered estuarine habitats. The sheltered rock and mud habitats of the western Pennar Gut, in the immediate vicinity of the intake structure are not considered an important habitat for little grebe in the context of the wider Cleddua estuary population.

Prey: Little grebe have a broad diet, feeding on small fish and aquatic invertebrate, both of which are affected by abstraction in Pennar Gut. As demonstrated in the Habitats Regulation Assessment report for the abstraction licence renewal<sup>12</sup> " *there is no evidence to suggest that entrapment at Pembroke Power Station is applying a detectable or significant ecological pressure to fish populations at the species and community level. The differences observed in fish abundance and community structure over the monitoring period, remain in line with expected natural variations and are of a magnitude and nature which is not significant from an ecological and conservational point of view.*" Furthermore, " *Entrapment monitoring undertaken as part of the current abstraction licence conditions indicates that the seasonal fluctuations and patterns observed in the abundance and species composition of fish communities have not changed since the power station became operational.*"

As such, the loss of prey species from abstraction has not been show to adversely affect little grebe populations since the Power Station has been operational.

#### 4.2.6 Shelduck

Habitat: Shelduck have been monitored in Milford Haven since 1992. The latest data (2019) suggest that number of breeding pairs and broods are following broadly cyclical trends since the monitoring began. Key factors in the size and productivity of the breeding population are the extent and quality of foraging habitat, which also sustains the overwintering population. No major loss of foraging habitat has been observed<sup>13</sup>. The breeding success of shelduck is driven by nesting predation (foxes and rats) and on the water by otter, herring gull and lesser black backed gulls.

Prey: Shelduck favour mud snail (*Hydrobia ulvae*), sifted from 'sloppy mud'. As demonstrated in Section 4.1.2 sheltered mud habitats remain functional in close vicinity to the power station intake. The abstraction of

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<sup>11</sup> Haycock, A. 2016. Available online: <https://pembsavifauna.co.uk/2020/07/16/little-grebe-2016/> [Accessed April 2024]

<sup>12</sup> Jacobs. 2024. Pembroke Power Station: Report to inform Habitats Regulations Assessment

<sup>13</sup> Hodges, J. 2020. Annual surveillance of summer Shelduck populations in the Milford Haven Waterway and Daugleddau Estuary, Pembrokeshire. Birds in Wales. 17-1

water from Pennar Gut has infrequently recorded *H.ulvae* but given the relatively small range of movement of individuals, the entrapment of mud snail is not predicted to result in a loss of feed resource to shelduck.

### **4.3 Additional Mitigation**

No impact has been reported from historic or current abstraction of water from Pennar Gut on SSSI habitats or species. Therefore there is no requirement for additional mitigation in the future.

## 5. Conclusions

- Pembroke Power Station has been operational since 2012, abstracting sea water from the western Pennar Gut at the mouth of the Pembroke River.
- The Milford Haven Waterway SSSI covers a wide range of habitats and species from the estuary mouth to the tidal limits on the Cleddau, Pembroke River and a number of other significant embayments and inlets.
- Of the marine features cited on the SSSI citation, a number of habitats and species are not reported from the Pembroke River or southern Milford Haven shoreline, those being the areas of the SSSI with a potential pathway to effect from abstraction:
  - Not reported within Pembroke River/south Milford Haven shoreline– caves and overhangs, moderately exposed rock and sand, rockpools, silled saline lagoons, tide swept algae, under boulders, European smelt, tentacled lagoon worm, *Gammarus chevreuxi*
  - Reported within the Pembroke River but outside of the zone of influence of the abstraction – mixed substrata, muddy gravel, eelgrass, saltmarsh, otter.
- Sheltered rock and sheltered mud are SSSI habitats recorded within the zone of influence of the abstraction. Both of these habitats have been identified as stable over the period of operation of the power station operation, and are therefore resilient to local scale changes in water velocity brought about by abstraction. It is considered likely that tidal action in these areas are more significant to the functioning of these habitats than abstraction pressure.
- Teal, wigeon, dunlin, curlew, little grebe and shelduck have all been reported from Milford Haven. These species utilise a variety of marine, freshwater and terrestrial habitats at different stages of their respective life cycles. The area of effect is considered to be high localised to the abstraction intake and represents a fraction of the available habitat available to waterfowl in the wider Pembroke River and Milford Haven Waterway. Furthermore it is considered unlikely that water fowl would preferentially target feeding and roosting habitat in close proximity to the relatively industrialised western end of Pennar Gut when large expanses of the wider estuary, inlets and embayments provide area of lower disturbance and shelter.
- Habitat loss for those species preferentially using mudflats and other maritime wetland areas has been shown to be negligible as a result of abstraction. Therefore there is no pathway to effect from habitat loss on water fowl from the abstraction.
- The Power Station abstraction does entrap a range of fish species, marine invertebrate and aquatic flora/macroalgae that represents a potential food source for cited water fowl. Studies undertaken to quantify and contextualise marine faunal and flora loss through abstraction has demonstrated no observable difference in fish or invertebrate populations in Pennar Gut during the operation of the Power Station. This indicates there is no pathway to effect from abstraction from the loss of prey items to cited water fowl.
- There are no predicted effects on SSSI species cited in the Milford Haven Waterways SSSI from the continued abstraction of water at Pembroke Power Station.